

REMARKS / ARGUMENTS

Initially, it is noted that this Amendment and Supplemental Information Disclosure Statement is in the newly required format for responses to office actions, such that each section of begins on a separate page.

Claim Amendments

By the foregoing amendments, independent Claims 1 and 9 have been amended to correct and clarify the novel features of the present invention.

More particularly, the “at least one chain branching units” recited in Claims 1 and 9 are, in fact, “chain branching units derived from at least one chain branching monomer having two or more reactive sites”, and Claims 1 and 9 have been amended to reflect this. This feature is disclosed in the present specification, as filed, at page 6, lines 13-20 (wherein it is explained that the polymeric compositions of the present invention contain homopolymer linear chains and copolymers, and the homopolymers and copolymers “only require at least the aforementioned C₈ to C₃₀ alkyl (meth)acrylate and chain branching monomers”) and at page 7, lines 21-24 (“Incorporation of the chain branching monomers having two or more reactive sites (e.g., polyfunctional monomers) into the polymeric composition ensures that the desired molecular weight ranges are achieved while providing for non-gelled polymer chains.”). Thus, the aforesaid amendment to Claims 1 and 9 does not introduce new matter and clarifies the nature of the chain branching units.

In addition, it is noted that, according to the disclosure on page 7, lines 13-20, the molecular weight of the polymeric composition of the present invention is at least 100,000 g/mol. Thus, Claims 1 and 9 have been amended, by the foregoing amendments, to recite that the polymeric composition, rather than the non-gelled polymer chains, as originally recited, has a molecular weight of at least 100,000 g/mol. In the foregoing circumstances, it is respectfully submitted that the foregoing amendment is supported by the present specification as originally filed and does not introduce any new matter into the present application.

In the foregoing circumstances, it is hereby respectfully requested that amended independent Claims 1 and 9 be entered into the present application for continued examination.

Claim Rejections Under 35 U.S.C. 103(a)

On pages 2-5 of the Office Action, the Examiner has rejected Claims 1-10, under U.S.C. § 103(a), as being obvious and, therefore, unpatentable over Carty et al (U.S. Patent No. 4,086,296) and, separately, as being obvious and, therefore, unpatentable over Brady et al (U.S. Patent No. 6,031,047). Applicants respectfully traverse these rejections for the reasons which follow.

The present invention relates generally to a polymeric composition. More particularly, as recited in amended independent Claim 1, the polymeric composition of the present invention comprises polymerizable units derived from at least one C₈ to C₃₀ alkyl (meth)acrylate monomer and chain branching units derived from at least one chain branching monomer having two or more reactive sites in an amount not greater than 0.10 weight percent based on the total weight of the C₈ to C₃₀ alkyl (meth)acrylate monomer. In addition, as recited in amended Claim 1, the chain branching unit results in the polymeric composition having non-gelled polymer chains and the polymeric composition has a weight average molecular weight of at least 100,000 g/mol. It is noted that the polymeric composition of the present invention, as recited in amended Claim 1, may (see, e.g., dependent Claim 3), but is not required to have multiple phases and functions as an additive for increasing the melt strength of thermoplastic resins.

In addition, the present invention also relates generally to a polymer blend composition. As recited in amended independent Claim 9, the polymer blend composition of the present invention comprises at least one thermoplastic resin and at least one polymeric composition of the type recited in Claim 1 and discussed hereinabove.

It is respectfully submitted that neither of the references cited by the Examiner (i.e., Carty et al. and Brady et al.) provide disclosures which render the present invention obvious to persons of ordinary skill in the relevant art. Initially, it is noted that the disclosures of both Carty et al. and Brady et al. concern core-shell type, or

"multiphase", polymer particles. More particularly, Carty et al. discloses a multiphase acrylic composite polymer having a first non-crosslinked phase and a final rigid thermoplastic phase. Brady et al. discloses poly(vinyl chloride) that is impact modified by a core/shell acrylic impact modifier having a core and a shell.

In contrast, as mentioned hereinabove, the polymeric composition of the present invention as recited in amended independent Claim 1 and included in the polymer blend composition recited in amended independent Claim 9, is not required to have multiple phases or to be a core-shell type particle. Rather, the polymeric composition of the present invention, comprises the polymerizable units (derived from at least one C₈ to C₃₀ alkyl (meth)acrylate monomer) and the chain branching units (derived from at least one chain branching monomer having two or more reactive sites), which are both polymerized together in a single phase. See, e.g., Example 1 of the present application, page 42, lines 6-8 - "The process provides one-stage spherical particles, two-stage core-shell particles and three-stage core-inner shell-outer shell polymer particles"; page 42, lines 19-21 stating inclusion of lauryl methacrylate (a C₈ to C₃₀ alkyl (meth)acrylate monomer) and allyl methacrylate (a chain branching monomer), as well as page 25, lines 12-14 (the first-stage EMM was rinsed and a sample taken prior to addition of second-stage EMM) and page 26, lines 1-2 (molecular weight of first stage polymer particle was greater than 100,000 g/mol). See also, Example 2 of the present application, page 26, lines 15-16 ("The process provides one-stage spherical particles and two-stage core-shell polymer particles."), page 26, lines 25-27 stating inclusion of lauryl methacrylate (a C₈ to C₃₀ alkyl (meth)acrylate monomer) and allyl methacrylate (a chain branching monomer), as well as page 27, lines 28-31 (samples of the first-stage EMM were analyzed and showed the first stage particles to have a molecular weight of 216,000). See also, Example 4 (page 30) wherein the first-stage particles of Example 1 were combined (mixed) with the final polymer product of Example 2 and compounded into a thermoplastic resin.

In the foregoing circumstances, the polymeric compound of the present invention, as recited in amended Claim 1 and included in the polymer blend composition recited in amended independent Claim 9, is a single phase. Thus, contrary to the Examiner's analysis, the polymeric composition of the present invention cannot be

compared to the multiphase acrylic composite polymer of Carty et al. or the core/shell acrylic impact modifier of Brady et al. Furthermore, it is inappropriate to compare the compositions of the soft and hard phases of the compounds disclosed by Carty et al. and Brady et al. to the compositions of each of the two required components of the present invention (i.e., the at least one C₈ to C₃₀ alkyl (meth)acrylate monomer and the at least one chain branching monomer having two or more reactive sites) separately, as is attempted by the Examiner. This is because the two required components of the polymeric composition of the present invention are polymerized and present together in a single phase.

Thus, persons of ordinary skill would not apply the disclosures of either Carty et al. or Brady et al. which relate to polymer compositions that must have multiple phases to develop the polymeric composition of the present invention as recited in independent Claim 1, which does not require multiple phases. It is respectfully submitted that, as is explained in further detail hereinafter, persons of ordinary skill in the art would not interpret recommended compositions for the different phases of a multiphase polymer particle to be directly translatable to be appropriate compositions for a single phase polymeric particle, such as the present invention. For the foregoing reasons, it is believed that amended Claims 1 and 9, as well as dependent Claims 2-8 and 10, are not obvious in view of either Carty et al. and Brady et al. and are, therefore, allowable over these references.

Nonetheless, as explained hereinafter, neither phase of the multiphase acrylic composite polymer of Carty et al., taken separately, includes all of the features of the polymeric composition of the present invention as recited in Claim 1 and included in the polymer blend composition recited in amended independent Claim 9.

Carty et al. discloses a multiphase acrylic composite polymer that is useful as a processing aid and lubricant for thermoplastic polymers and which generally comprises:

- a first non-crosslinked phase of molecular weight of about 7,500 to 50,000 polymerized from a first monomer emulsion or solution,
- and a final rigid thermoplastic phase polymerized in the presence of the first phase from a second emulsion or solution and having a molecular weight of from about 400,000 to about 5,000,000.

The first monomer emulsion or solution is at least 25 wt % of at least one alkyl acrylate having 1 to 18 carbon atoms, 0 to 75 wt % of another acrylic monomer, and 0 to 75 wt % of another copolymerizable ethylenically unsaturated monomer. The second emulsion or solution, from which the final rigid thermoplastic phase is polymerized is 35-100 wt % of at least one monomer which is a methacrylate, acrylate, styrene or substituted styrene, and 0 to 65 wt % of another copolymerizable ethylenically unsaturated comonomer.

Thus, neither of the first non-crosslinked phase and the final rigid phase of Carty et al. include the chain branching monomers having two or more reactive sites that are required to be included in the polymeric composition of the present invention and result in the presence of the non-gelled polymer chains. In the foregoing circumstances, both particle phases disclosed by Carty et al. also, necessarily, lack the non-gelled polymer chains of the polymeric composition of the present invention. For the sake of clarity, the "reactive sites" of the chain branching monomers of the present invention should be understood to be C-C double bonds, which, it is submitted is readily understood by persons of ordinary skill, provide sites at which the monomer can react with other molecules (including monomeric and polymeric molecules). Thus, in the context of the present invention, "reactive sites" are synonymous with "C-C double bonds".

With the foregoing in mind, it is noted that the copolymerizable ethylenically unsaturated comonomer of Carty et al., which need not even be present (0 to either 65 or 75 wt % , depending on which phase) requires the inclusion of only one reactive site (i.e., C-C double bond). In contrast, the chain branching monomers of the present invention are required to have two or more reactive sites (i.e., C-C double bonds) (examples of suitable chain branching monomers is provided in the present specification at page 12, lines 20-30). There is no indication, or suggestion, in Carty et al. or in the general knowledge of persons of ordinary skill in the art concerning the inclusion of chain branching monomers such as those required by the present invention in either phase disclosed by Carty et al.

Contrary to the Examiner's assertion on page 3 of the Office Action, in the absence of chain branching monomer in the final rigid thermoplastic phase of Carty et al., the presence of non-gelled polymer chains cannot be an inherent feature of the final

rigid thermoplastic phase of Carty et al.'s polymer particles (since the chain branching monomers that would be responsible for their presence is absent from the final rigid phase). Also contrary to the Examiner's analysis, the chain branching monomer of the polymeric composition of the present invention is not analogous to the final rigid thermoplastic phase of Carty et al. and, therefore, the amount of final rigid phase thermoplastic phase in the multiphase particle of Carty et al. is not analogous to the amount of at least one chain branching monomer that is present in the polymeric composition of the present invention (i.e., "not greater than 0.10 wt %"). In other words, Carty et al. does not suggest or make obvious the polymerization of not greater than 0.10 wt % of at least one chain branching monomer with at least one C₈ to C₃₀ alkyl (meth)acrylate monomer, as is required in the present invention as recited in amended independent Claims 1 and 9.

Furthermore, it is noted that the first non-crosslinked phase disclosed by Carty et al. is of lower molecular weight (i.e., about 7,500 to 50,000) than the polymeric composition of the present invention (i.e., at least 100,000).

In the foregoing circumstances, it is respectfully submitted that the disclosure of Carty et al. does not render obvious the present invention as recited in either of amended independent Claims 1 or 9. Thus, it is submitted that amended Claims 1 and 9 are allowable. Moreover, since Claims 2-8 and 10 are all dependent, directly or indirectly, from either Claim 1 or 9, it is submitted that these claims are also non-obvious and, therefore, allowable.

With reference now to Brady et al., it is respectfully submitted that the disclosures of this reference suffer the same deficiencies as Carty et al. More particularly, neither phase (i.e., the core or the shell) of the core/shell acrylic impact modifier of Brady et al. includes all of the features of the polymeric composition of the present invention as recited in Claim 1 and included in the polymer blend composition recited in amended independent Claim 9. It is understood by persons of ordinary skill in the art that the recommended compositions for the different phases of a multiphase polymer particle is not directly translatable to be appropriate compositions for a single phase polymeric particle, such as the present invention.

The disclosure of Brady et al. is focused upon the composition a core/shell impact modifier that is blended with poly(vinyl chloride). The shell phase of this core/shell particle is formed from 50-90 parts polymerized units of methyl methacrylate and 10-50 parts of polymeric units of a C₂-C₈ alkyl acrylate. The core is a crosslinked copolymer mainly of polymeric units of butyl acrylate. Again, neither phase of the particle disclosed in Brady et al. includes units derived from at least one chain branching monomer having two or more reactive sites, nor does either phase disclosed in Brady et al. include non-gelled polymer chains, which are both required features of the polymeric composition of the present invention, as recited in amended Claims 1 and 9.

More specifically, neither methyl methacrylate, nor C₂-C₈ alkyl acrylate, are "chain branching monomers", as that term is used and defined in the present specification (see page 12, lines 20-30 and the Examples). Thus, contrary to the Examiner's finding, the non-gelled polymer chains cannot be an inherent feature of the final rigid phase of Carty et al.'s polymer particles, since the chain branching monomers that would be responsible for their presence is absent from the final rigid phase.

Also contrary to the Examiner's analysis, the chain branching monomer of the polymeric composition of the present invention is not analogous to the shell phase of the core-shell particle of Brady et al. and, therefore, the amount of shell phase in the core-shell particle of Carty et al. is not analogous to the amount of at least one chain branching monomer that is present in the polymeric composition of the present invention (i.e., "not greater than 0.10 wt %"). In other words, Carty et al. does not suggest or make obvious the polymerization of not greater than 0.10 wt % of at least one chain branching monomer with at least one C₈ to C₃₀ alkyl (meth)acrylate monomer, as is required in the present invention as recited in amended independent Claims 1 and 9.

In the foregoing circumstances, it is respectfully submitted that the disclosure of Brady et al. does not render obvious the present invention as recited in either of amended independent Claims 1 or 9. Thus, it is submitted that amended Claims 1 and 9 are allowable. Moreover, since Claims 2-8 and 10 are all dependent, directly or

indirectly, from either Claim 1 or 9, it is submitted that these claims are also non-obvious and, therefore, allowable.

In view of the foregoing amendments and remarks, re-examination of allowance of all pending claims, including amended independent Claims 1 and 9, as well as dependent Claims 2-8 and 10, are respectfully requested.